



*Annual Report for FY 2022*

# Extramural Acquisition Innovation and Research Activities

*Pursuant to section 4142(f) of Title 10, U.S. Code*

Director of the Acquisition Innovation Research Center  
Office of the Under Secretary of Defense  
for Acquisition and Sustainment

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## Summary

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The Acquisition Innovation Research Center (AIRC) was established in September 2020 to help fulfil the Department of Defense's (DoD's) needs for innovation in the organizational practices of acquiring, fielding, and sustaining operational capabilities by leveraging Academia (see 10 U.S. Code, section 4142(f)).

AIRC seeks to enable an innovative defense acquisition system and focuses on applications (experiments, demonstrations, pilots) rather than academic, theoretical research. The basis is on improving acquisition outcomes for the warfighter. This encompasses tackling barriers and enduring challenges to innovation by thinking systemically about defense acquisition. AIRC applies fresh, new insights from non-traditional disciplines across academia, including the disciplines of management, business, law, public policy, education, data science, and engineering. AIRC has leveraged faculty, students, and researchers from 18 universities.

Fiscal year (FY) 2022 was a growth year for AIRC. Initial research projects and investments have matured and produced a large number of practical pilot ideas for tackling some of the DoD's most enduring organizational challenges for improving acquisition outcomes. AIRC's 32 initiatives to date involve a broad range of functions across acquisition as well as key inputs such as requirements and budgets (through the Planning, Programming, Budgeting, and Execution [PPBE] system). Topics come from three primary sources: (1) areas where the DoD has identified major issues in acquisition that could benefit from innovation, (2) statutory tasks assigned by Congress, and (3) targeted opportunities and new ideas identified from faculty and students at the universities in AIRC's collaborator network.

The sponsor base over the first two years has grown to include 13 DoD entities. This reflects strong strategic engagement from entities across the Fourth Estate—organizations in the Office of the Secretary of Defense (OSD), the Joint Staff, and the Defense Agencies. AIRC is also working to strengthen its support from the Military Services to initiate important research tasks on key challenges.

In FY 2022, AIRC initiatives have produced thought-provoking and actionable results and outputs that hold potential for major improvements, such as:

- New requirements approval processes that might cut requirement approval time in half.
- Data strategy and tools that could improve decision making by more efficiently leveraging extramural analytic capabilities (while retaining needed security for sensitive data).
- Pilots and activities to focus technological innovation and application on warfighting outcomes and priorities.

While AIRC is just two years old, the center is already producing promising new and innovative ideas. Many of these ideas are major and structural. Nevertheless, with strong leadership support, the DoD is using available resources to pursue key applied pilots. Continued support—along with continued realism in what can be accomplished from initial steps—has allowed AIRC to succeed in its mission. Applying academia to acquisition challenges is working.



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# The Acquisition Innovation Research Center

The Acquisition Innovation Research Center (AIRC) was established in September 2020 to fulfil the Department of Defense’s (DoD’s) needs for innovation in the organizational practices of acquiring, fielding, and sustaining operational capabilities. AIRC also fulfills the statutory requirement (codified in 10 U.S. Code, section 4142(f) (formerly section 2361(a))) for leveraging academia for innovative concepts (see Appendix A).

## What Is AIRC Trying to Do?



*Engaging academia to improve acquisition outcomes*  
*Established September 2020*  
*Fulfilling 10 USC 4142*

Figure 1: AIRC Universities and Overview

The overall objective of AIRC is to enable an innovative defense acquisition system (Figure 1). This encompasses tackling barriers and enduring challenges to innovation by thinking systemically about defense acquisition. AIRC applies fresh, new insights from non-traditional disciplines across academia, including the disciplines of management, business, law, public policy, education, data science, and engineering.

AIRC focuses on applications—experiments, demonstrations, pilots—rather than conducting purely academic, theoretical research. The focus is on improving acquisition outcomes for the warfighter. AIRC seeks measurable results so that it can determine if the innovations are working, the effectiveness of these initiatives, and their costs.

## AIRC Activities and Scope

Figure 2 summarizes the extent of AIRC’s activities over the first two years of its existence. AIRC’s initiatives—32 to date—involve a broad range of functions across acquisition as well as key inputs such as requirements and budgets (through the Planning, Programming, Budgeting, and Execution [PPBE] system). AIRC project topics come from three primary sources: (1) areas where the DoD has identified major acquisition issues that could benefit from innovation, (2) statutory tasks assigned by Congress, and (3) targeted opportunities and new ideas identified from faculty and students at the universities in AIRC’s collaborator network.

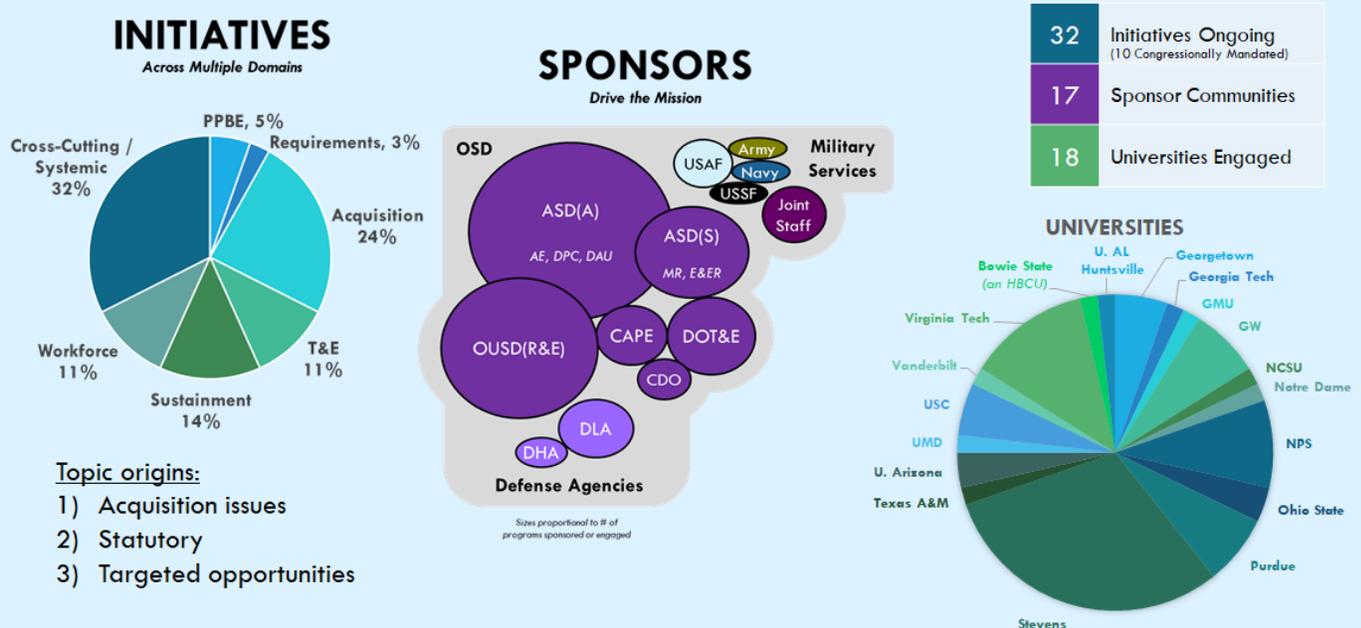


Figure 2: AIRC Activities and Scope

The sponsor base over these two years includes 13 major entities. This reflects strong strategic engagement from entities across the Fourth Estate—organizations in the Office of the Secretary of Defense (OSD), the Joint Staff, and the Defense Agencies—to help initiate research tasks in AIRC. The center has growing involvement from the Military Services, and AIRC is working to expand their involvement.

Finally, AIRC was established to engage the best faculty from across a large contingent of the most relevant universities, leveraging the university network in the Systems Engineering Research Center (SERC). To date, AIRC has leveraged faculty, students, and researchers from 22 universities, including Historically Black Colleges or Universities (HBCU) and Minority Institution (MI).

Other major accomplishments during FY 2022, include:

- The Department identified a permanent AIRC director.
- AIRC provided pilots, prototypes, recommendations, and next steps for 10 initiatives:

- New approval processes for requirements that might cut requirement approval time in half. Training, governance, and operational model pilot options;
  - Data strategy and tools that could improve decision making by more efficiently leveraging extramural analytic capabilities (while retaining needed security for sensitive data);
  - Clarified the nature of the innovation problem. Identified seven pilot options to focus technological innovation and application on warfighting outcomes and priorities;
  - Intellectual property (IP) valuation training and options for the IP Cadre;
  - Preliminary debarment report to Congress, assessing statutory versus discretionary debarment and options to address concerns;
  - Decision-making framework, algorithms, and tool for Additive Manufacturing for sustainment;
  - Assessed/ensure completeness and accuracy of reorganized acquisition statutes (Title 10 U.S. Code), recommended fixes;
  - Action options, model, and pilot design to satisfy FY 2017 National Defense Authorization Act (NDAA) on 3<sup>rd</sup>-Party EVMS reviews;
  - Two rounds of data science competition, identifying management and architectures to address operational topics; and
  - Advanced prototype tools for portfolio reviews (IAPRs) and mission engineering (ME).
- AIRC successfully oversaw the completion of eight incubator projects. AIRC engaged with multiple universities and DoD stakeholders on innovative approaches and pilot concepts to address major challenges.
    - AI for training;
    - gamified training;
    - decision knowledge representation;
    - aligning incentives for agility;
    - T&E for complex, artificial intelligence and machine learning (AI/ML), and risky systems; and
    - assessing value (cost/benefit) on investments.
  - AIRC expanded its HBCU and MI network by hosting outreach and engagement events. Bowie State (an HBCU) and Texas Tech (an MI) are both participants in the Digital Data Grand Prix.
  - AIRC kicked off a strategic relationship with the Defense Acquisition University (DAU) to enable innovation and transformation in DAU curriculum, connecting AIRC universities with DAU faculty.

## The Pillars in the AIRC Innovation Framework

There are four major pillars in AIRC’s strategic approach, as outlined by Figure 3. Information flow (data and knowledge sharing) are key enablers to inform, improve, and accelerate acquisition functions and decisions.



Figure 3: AIRC’s Pillars for Acquisition Innovation

AIRC is also looking at how those acquisition tools and functions can be improved by leveraging better information, models, and commercial innovation. Moreover, models and analytics (such as policy test ranges and better decision tools) are being explored to truly enable evidence-based decision-making. Finally, underneath these three pillars are the all-important aspects of addressing people and culture. As shown by Figure 3, acquisition is a workforce-driven organization, and culture affects how people operate and function. Innovation cannot proceed without addressing workforce improvements and tackling cultural barriers. Culture eats strategy for breakfast, so without tackling culture we are doomed to marginal improvements.

## A Systems Approach to Innovating the Capability Ecosystem

Defense acquisition is a system. As shown in Figure 4, AIRC is taking a systems approach to examining ways to improve acquisition outcomes through improvements in inputs and processes.

18 of 37 ongoing projects

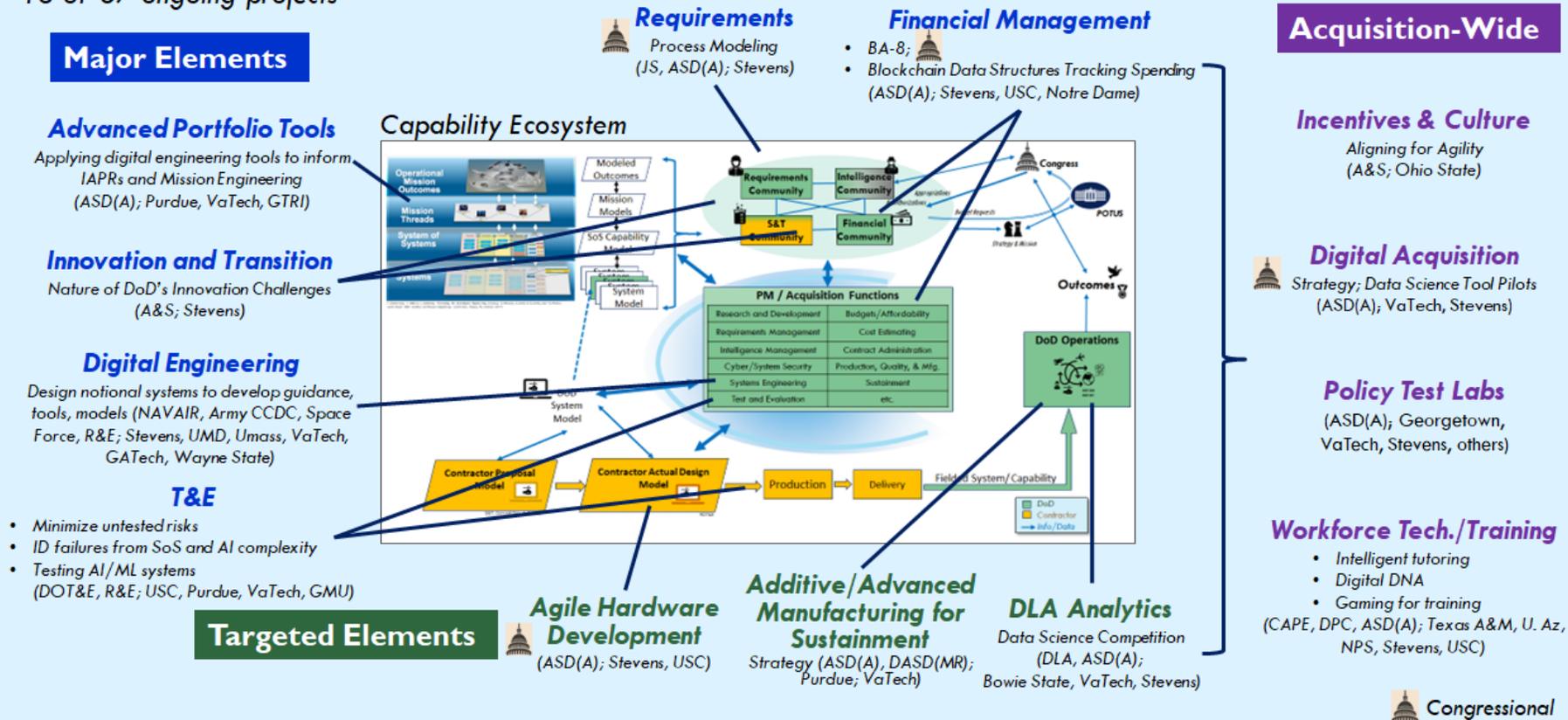


Figure 4: Applying Innovative Academia Solutions into the Capability Ecosystem

AIRC's tasks to date engage at three different levels: (1) acquisition-wide systemic elements, (2) major system elements, and (3) targeted functions and elements. As shown in Figure 4, 18 of the 32 ongoing projects are included around a systems diagram of the defense capability ecosystem to graphically illustrate how specific AIRC research tasks are engaging the defense acquisition system.



Some of these tasks are congressionally directed while others are addressing challenges that the DoD has raised or are new, innovative ideas from Academia in response to broad topic areas from the DoD (see Table 1 below).



#	Area	Innovation Tasks (🏛️ = Congressional)	Sponsors	Universities	Status
<b>COMPLETED INITIATIVES</b>					
1	Digital Medicine	Joint Pathology Center (JPC) Tissue Bank	DHA	George Washington University, Ohio State University, Stevens Institute, and Vanderbilt University	Completed Mar 2021
2	Innovation	🏛️ AIRC Management & Stand up	A&S, R&E	Stevens Institute	Completed Sept 2021
3	IP	Intellectual Property (IP) Repository	A&S/AE	Georgetown University	Completed Sept 2021
4	IP	IP Management, Evaluation, and Valuation	A&S/AE	Virginia Tech	Completed Sept 2021
5	Policy Codes	🏛️ 10 US Code (USC) Acquisition Statutes Reorganization	A&S/AE	Virginia Tech	Completed Feb 2022
6	Requirements	🏛️ Capability Requirements Process Assessment / JCIDS Report	JS, A&S/AE	Stevens Institute	Completed Jun 2022
7	Innovation	Addressing the Nature of the DoD Innovation Problem	A&S/AE	Stevens Institute	Completed Jun 2022
8	EVM	🏛️ 3 <sup>rd</sup> Party Earned Value Management (EVM) System Certification	A&S/AE	Stevens Institute and Purdue University	Completed Jul 2022
<b>INCUBATORS</b>					
9	Decisions	<u>Phase I</u> : Calculating ROI for Better Decisions	A&S, R&E	Georgetown University	Completed Mar 2022
10	Decisions	<u>Phase I</u> : Knowledge Representation for Decision Making	A&S, R&E	Naval Postgraduate School	Completed May 2022
11	Incentives	<u>Phase I</u> : Incentivizing Innovation and Culture	A&S, R&E, USAF	Ohio State University	Completed Jun 2022
12	T&E	<u>Phase I</u> : Test and Evaluation (T&E) to Minimize Risks in Validation	DOT&E	University of Southern California	Completed Oct 2021
13	T&E	<u>Phase I</u> : T&E of AI/ML	DOT&E	Virginia Tech and Purdue University	Completed May 2022
14	T&E	<u>Phase I</u> : Assessing Failures from System Complexity (T&E)	DOT&E	George Mason University	Completed Jun 2022
15	Workforce	<u>Phase I</u> : Cognitive Training Assistants for Cost Estimators	A&S, CAPE	Texas A&M and University of Arizona	Completed Jun 2022
16	Workforce	<u>Phase I</u> : Game Simulations for Training Contracting Officers	A&S, CAPE	Naval Postgraduate School and North Carolina State University	Ongoing
<b>ONGOING INITIATIVES</b>					
17	Transformation	🏛️ Innovative, Data-Enabled Acquisition Strategy (IDEAS) (and sub-tasks)	A&S/AE	Stevens Institute and Virginia Tech	Ongoing

#	Area	Innovation Tasks (🏛️ = Congressional)	Sponsors	Universities	Status
18	Agile	🏛️ Agile Management of Non-Software Programs	A&S/AE	Stevens Institute, University of Southern California, and Naval Postgraduate School	Ongoing
19	Budgets	🏛️ Agile Software Pilots: Budget Activity 8 (BA-8) Colorless Funding	A&S/AE	Stevens Institute, University of Southern California, and Naval Postgraduate School	Ongoing
20	Debarment	🏛️ Debarment and Fair Labor Standards	A&S/DPC	George Washington University and Stevens Institute	Ongoing
21	Bid Protests	🏛️ Assessment of Bid Protests	A&S/DPC	George Washington University and Stevens Institute	Ongoing
22	Analysis	🏛️ Tracking the Implementation of Acquisition Reforms	A&S/AE	Stevens Institute	Ongoing
23	Capability ME/PfM	Data-Driven Capability Portfolio Management (Pfm) Pilot	A&S/AE	Purdue University, Virginia Tech, Stevens Institute, and Georgia Tech	Ongoing
24	Sustainment	Additive/Advanced Manufacturing (A/AM) and Digital Engineering Strategy	A&S/AE, A&S/MR	Purdue University and Virginia Tech	Ongoing
25	Budgets	Blockchain for Tracking Department of Defense (DoD) Money Flows	A&S/AE, USAF	Notre Dame University and Stevens Institute	Ongoing
26	Data	Defense Data Grand Prix	A&S/AE, DLA	Virginia Tech and Stevens Institute	Ongoing
<b>NEW STARTS</b>					
27	Transformation	Acquisition Integration and Interoperability (Jointness) – Phase I	A&S/AE	Stevens Institute	Kickoff Jun 2022
28	Policy Testing	Policy Test Lab	A&S	Georgetown University, University of Arizona, George Washington University, and University of Alabama Huntsville	Kickoff July 2022
29	Sustainment	Submarine Repair Capabilities and Capacity	A&S/MR	Naval Postgraduate School	Kickoff July 2022
30	Portfolio Mgmt	Portfolio Performance Analysis and Visualization	A&S/AE	University of Maryland	Kickoff Aug 2022
31	Workforce	DAU/AIRC Quarterly Research Forums	DAU	Stevens Institute	Kickoff Aug 2022
32	Logistics	University Capstone Marketplace	R&E, USSOCOM	Stevens Institute	Kickoff Sep 2022

Table 1: List of Completed, Current, and Upcoming AIRC Projects<sup>1</sup>

<sup>1</sup> In addition to these 32 projects, AIRC is collaborating with its research partners and is planning five additional projects (for a total of 37 projects). These subject areas include a Phase II for the Cognitive Training Assistants and Gamification work, and a follow-on for the Standards of Models project. The planning of these additional projects is ongoing, and they will be included in the FY 2023 report.

To illustrate how AIRC's research tasks are tackling the capability ecosystem, three examples will be summarized below. These three tasks are (i) improving the fielding of capabilities by improving the speed of getting requirements to the acquisition system, (ii) the acquisition-wide task of digital acquisition strategy and pilots, and (iii) addressing the DoD's innovation problem by identifying exactly what the major barriers are in the first place.

## Example 1: Streamlining the Requirements Process

First, AIRC recently completed a research task focused on how to reduce the requirements cycle time. This is one of the statutory study elements requested by Congress in section 809 of the FY 2021 NDAA. Figure 5 shows the key elements of this project, which was conducted by principal investigators from the Stevens Institute of Technology. While not part of the defense acquisition system proper, delays in setting requirements directly affect the time it takes to develop and field needed capabilities.

AIRC tackled this challenge through a mixed methods approach. A key element was the modeling of the requirements process using available time-series data, which allowed the team to identify potential streamlining candidates for further assessment and piloting.

PI: Prof. Mo Mansouri (Stevens Institute of Technology)

**Why?** Delays in requirements setting directly delays acquiring and fielding needed capabilities

**What?** Modeled the requirements process to identify streamlining candidates

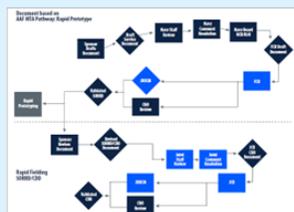
### Next step pilot options identified:

**1. Pilot an MDAP through a combined ICD/CDD process**



(Verify simulated potential to reduce from 852 days to 444 days)

**2. Pilot an ACAT II/III or MTA through SOCOM SORRD process**



(Verify simulated potential to reduce from 852 days to 309 days)

SORRD=Special Operations Rapid Requirement Document

**3. Apply Value Stream Mapping (Lean) to “walk” the process and identify new efficiencies**



**4. Automate & AI-assist workflow management. Enforce schedules. Collect data.**



**5. Clarify end-to-end governance**



- Service and COCOM gap analysis roles
- Initial document drafting and early collaboration on joint requirements

**6. Expand cadre of certified civilians to improve requirements document quality**



**7. Use more cross-functional teams**



Figure 5: Ideas for Streamlining the Requirements Approval Process

These models and associated process and literature reviews identified two alternative requirements processes with the theoretical potential of reducing approval time from the current average of 852 days to as little as 444 and 309 days, respectively. A pilot and further investigation are needed to see whether those possibilities are realistic, but these results highlight a potential to cut approval time in half (or possibly more).

Other ideas include applying the Value Stream Mapping process to walk through the requirements process to identify new efficiencies. It could also be possible to apply process automation and artificial intelligence (AI) to help manage workflows, enforce schedules, and collect further data on process cycle times and underlying causes to seek other ways to improve the requirements process. In addition, there appear to be opportunities to better clarify the end-to-end governance processes to oversee and drive requirements—especially when multiple entities are involved. Moreover, in at least some cases, requirements approvals were delayed due to lack of quality in initial requirements documents; expanding the size and quality of the professional civilian workforce supporting the military in requirements setting and documentation could help here. Finally, an

increased use of cross-functional teams could more effectively share and address functional concerns and speed reviews.

This project shows how faculty, students, and domain specialists can begin tackling a major challenge (i.e., the requirements process) to identify ideas and approaches for further testing and implementation. Data were limited, yet the potential from these ideas is striking.

## Example 2: Innovative, Data-Enabled Acquisition Strategy

Second, AIRC is conducting a major effort to develop a digital data strategy and data-science pilots/tools to improve acquisition. This effort relates to and supports the DoD’s efforts called for by Congress in section 836 of the FY 2021 NDAA. Figure 6 shows the key elements of this project, which was completed by principal investigators from the Stevens Institute of Technology and Virginia Tech.

**Why?** Need specific ways to leverage data to inform decisions, increase agility/speed, and improve acquisition outcomes

**What?** Develop strategy and pilot tools for improving acquisition through digital transformation

**Status:**

- Strategic concepts drafted 
- Pilots underway to improve efficiency and speed of access for external analysts

PIs: Dr. Philip S. Anton (Stevens Institute of Technology)  
Dr. Laura Freeman (VaTech)

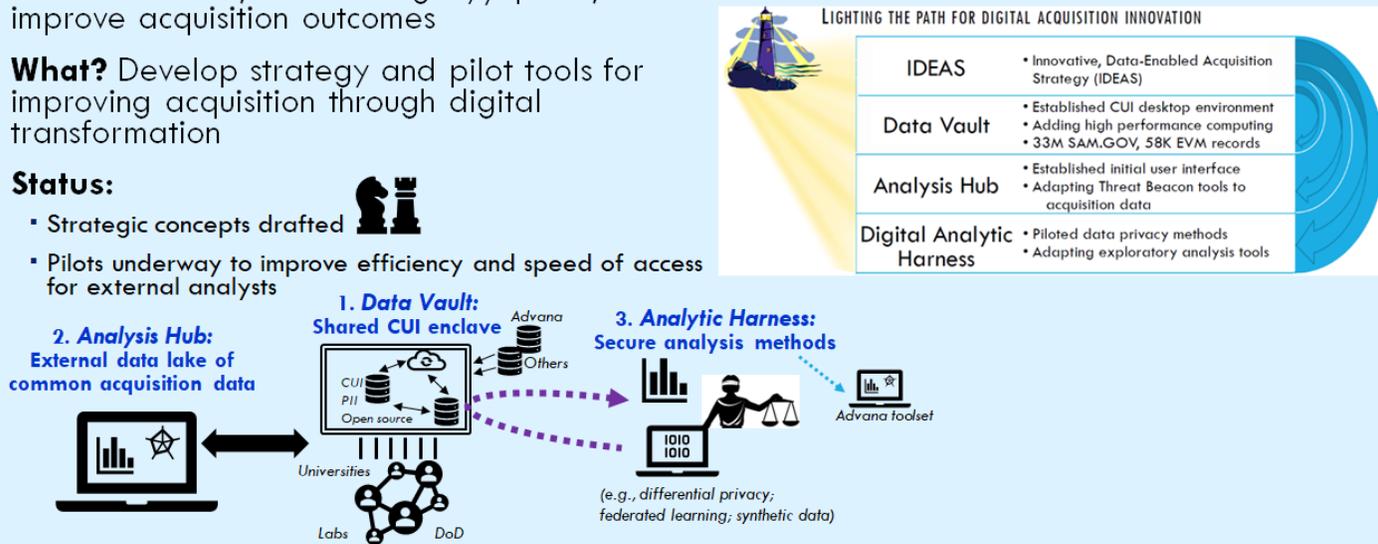


Figure 6: The Innovative, Data-Enabled Acquisition Strategy (IDEAS)

Long recognized by the Department and part of our major initiatives (including a major pillar in AIRC’s strategy), the DoD needs specific ways to leverage data to inform decisions, increase the speed and agility of acquisition, and improve acquisition outcomes (time, quality, cost, and relevance). Part of the challenge is that DoD-wide strategies identify the key principles in leveraging data, but acquisition needs a specific strategy and piloted tools to implement digital transformation of acquisition (i.e., digital acquisition).

In response, AIRC built on the DoD’s data principles to develop a strategic approach and concept for consideration and possible adoption by DoD leadership. As noted by Figure 6, this approach is documented in what we call the Innovative, Data-Enabled Acquisition Strategy (IDEAS).

The second key element is to begin piloting specific approaches for improving data access and use. These applied pilots are underway and involve three efforts: (1) a “data vault,” (2) an “analysis hub,” and (3) a digital analytic harness.

The Data Vault tackles challenges related to the identification and access of data. Often times, just knowing what data are available for a relevant acquisition analysis is a challenge, so the Data Vault identifies available data (public and restricted; commonly known and obscure). Accessing even some well-known data (even public data) by external analysts is a challenge, so the vault is assembling a corpus of analysis ready data. Finally, the Data Vault provides a secure, high-performance computing environment

for multiple organizations (external and internal to the DoD) to quickly gain access and collaborate on data analyses. This will improve the efficiency of access by avoiding the need for every organization (university, DoD lab, or other entities) to create its own Controlled Unclassified Information (CUI) enclave (an expensive, time-consuming, and rather painful process) to protect sensitive information while leveraging for analytic purposes.

Second, the Analysis Hub provides a modern, open-source (i.e., non-proprietary and free) user interface and set of advanced analytic tools to the Data Vault, efficiently facilitating extramural and intramural analysis across acquisition.

Lastly, the Digital Analytic Harness is tackling the problem that many sensitive data cannot be exposed to the large set of extramural data analysts that have the expertise to provide useful, decision-quality perspectives to improve acquisition decision making. Here, AIRC researchers are reviewing data-science approaches to sensitive data use (e.g., differential privacy, federated learning, synthetic data, black-box analytic techniques) being developed by academia and industry researchers and bringing the most applicable into the computing environment.

While the scope of the data exploitation challenge in the DoD is huge, this effort is taking real, practical, incremental steps forward. Initial progress is promising, and efforts are continuing. The focus on applied strategy, research, and piloting—together with an emphasis on sharing and open-source tools—has an excellent potential to make a real difference in efficiently improving the DoD's data analytic and decision-making capabilities across acquisition functions and up-and-down the decision structures.

### Example 3: The Nature of the Defense Innovation Problem

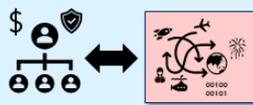
Finally, AIRC recently completed an effort to assess what the fundamental issues are in the oft-discussed challenges of innovating in the DoD. AIRC sought pilot options to address these fundamental barriers. Tackling defense innovation is a major strategic area identified for AIRC by the DoD, and it relates directly to the intent of Congress in establishing AIRC—an innovation research center—in 10 U.S. Code § 4142. Figure 7 shows the key elements of this project, which was conducted by a fellow at the Stevens Institute of Technology.

**Why?** DoD has many innovation pathways and organizations but little analysis of what is obstructing the fielding of innovative systems

**What?** Interview experts to clarify problem and lessons; identify systemic barriers

**Next steps:** Pursue identified pilot options:

**1. Create and empower Experimentation Organizations**



- Pilot in Army Futures Command or a Rapid Capability Office
- Focus on military outcomes, not just good ideas
- Teach and sustain red-teaming & experimentation
- Leadership with the authority to move money and influence and support functions

**2. Pilot repositories of learning from experimentation organizations**



- Pilot in Army Futures Command or a Rapid Capability Office
- Review/leverage knowledge representation best practices

**3. Train cadre of future leaders and workforce**



- Pilot at DAU or a war college
- Build on School of Advanced Military Studies (SAMS) and Seminar XXI curricula
- Assess former SAMS and Seminar XXI students
- Train to work in dynamic environments & operate through iteration to push change where needed

• AIRC is doing these now for organizational innovation  
• Extend to experimentation and technical capabilities

**4. Pilot MIL/CIV incentives and promotion criteria**



Cadre

**5. Identify additional lessons on empowerment factors**

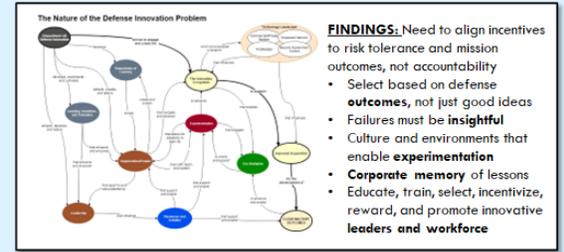


Past successes and failures

**6. Build simulators to test innovation incentives policies**



Test before broad implementation



**FINDINGS:** Need to align incentives to risk tolerance and mission outcomes, not accountability

- Select based on defense outcomes, not just good ideas
- Failures must be **insightful**
- Culture and environments that enable **experimentation**
- **Corporate memory** of lessons
- Educate, train, select, incentivize, reward, and promote innovative leaders and workforce

Figure 7: The Nature of the Defense Innovation Problem, and Ways to Address It

The DoD has many “innovation” pathways and organizations to outreach to the private-sector innovation ecosystem (e.g., Silicon Valley and start-ups across the United States and our allies). Rather than diving in to seek yet another potential “magic bullet,” AIRC noted that little analysis has been performed on what exactly we mean by innovation (it means different things to different people) and what is obstructing the actual fielding and use of innovative systems and technologies in military operations.

In response, AIRC researchers and students combined the findings from a literature review and discussions with experts across the innovation and acquisition communities to clarify what the problems are, what lessons have been learned, and what the key systemic barriers are to innovation.

The research found that the DoD needs to align incentives to risk tolerance and mission outcomes rather than focusing on accountability for not having perfect research, development, and acquisition. We must select from the wide range of innovative ideas based on the priority and value they provide to defense outcomes—not just selecting innovative ideas because they seem good (and complaining when such good ideas with rather lower priorities fail to cross the so-called “valley of death” to acquisition programs and fielding). Also, we must focus not just on “failing fast” but instead on ensuring that we learn something from failures (e.g., learning is what’s important—not the failing). In

addition, the DoD needs a real culture and organizational environments that enable experimentation on new concepts and applications so that new ideas can be explored, tested, improved, and ultimately prioritized based on mission outcomes (not just fascination with new technologies). Moreover, the DoD needs a corporate memory of lessons learned from such experimentation, else we risk repeating such explorations. Finally, the DoD needs to educate, train, select, incentivize, reward, and promote innovative leaders and workforce; without such support, culture and the drive for bureaucratic perfection will continue to greatly hamper innovative efforts.

As a result, the study identified specific pilot options to begin addressing these findings. These pilots include:

- (1) creating and empowering organizations for experimentation,
- (2) piloting repositories of learning from those experimentation organizations,
- (3) training a cadre of future leaders and workforce (as a first step to larger-scale training),
- (4) piloting military (MIL) and civilian (CIV) workforce incentives and promotion criteria (again, initially in a pilot cadre),
- (5) conducting further research to identify additional lessons and empowerment factors for the DoD to adopt, and
- (6) building simulators to test innovation incentives policies (to test policies before broader implementation).

If innovation were easy, we'd be doing it already. This project identified some major challenges that will take years to fully address, but these pilot options are specific steps that the DoD can take now if available support and resources are made available.

It is also interesting to note that, in a broader sense, these recommendations reflect many of the approaches and ideas that AIRC is developing for acquisition policies and processes as a whole. We recognize that culture and empowerment are key elements to acquisition innovation (i.e., not just for the innovative technologies being acquired but in innovative way of acquiring capabilities). Workforce training and incentives are key. Data, information, and lessons are vital to collect, preserve, and share. Finally, simulators can be an important element in policy-making.

## Where Are We Headed?

Although we listed 18 of the current 32 projects and dove more deeply into three of them, it is useful to show other examples of recent and pending projects. Figure 8 lists and illustrates what these are and why we are pursuing them.

### Identified Innovation Opportunities

<u>What?</u>	<u>Why?</u>
 <p><b>Transitioning across the “valley of death”</b> Develop ontology and tools to preserve S&amp;T knowledge to facilitate transition.</p>	<p><i>Transition and delivery of mission-focused innovative capabilities.</i></p>
 <p><b>Innovative workforce training approaches</b> Engage university faculty with education best practices and apply to DAU-identified methodological needs and challenges.</p>	<p><i>Identify &amp; implement innovative, improved workforce training (DAU). Statutory (10 USC 1746a: FY22 NDAA, Sec. 801).</i></p>
 <p><b>Intellectual property (IP) game models</b> Develop/exercise game theory models from economics to explore DoD-unique negotiating equities and limitations to inform negotiation approaches, insights, and practices.</p>	<p><i>Improved workforce capabilities to negotiate for DoD needed IP.</i></p>
 <p><b>Contested logistics</b> Work with SOCOM to identify specific operator challenges and develop innovative approaches within student research teams.</p>	<p><i>Innovative ideas to specific logistics challenges.</i></p>
 <p><b>Acquiring joint enterprise solutions</b> Identify key barriers and mechanisms to address them.</p>	<p><i>Need mechanisms to develop and deploy joint enterprise capabilities (e.g., JADC2).</i></p>
 <p><b>Policy test labs</b> Develop simulation reference architectures. Simulate policy situations and test/explore policy options (e.g., improve SBIR outcomes and avoid SBIR “mills”).</p>	<p><i>Simulate policy effects to test before implementation.</i></p>

Figure 8: Identified Innovation Opportunities in Additional Acquisition Areas

**Transitioning across the “valley of death.”** Here we propose development of ontology and tools to preserve S&T knowledge to facilitate transition. This is important so that DoD has an informed ability to transition and deliver mission-focused innovative capabilities.

**Innovative workforce training approaches.** AIRC is engaging university faculty, identifying education best practices, and applying methodological needs and challenges identified by the Defense Acquisition University (DAU). This is important for identifying and implementing innovative, improved workforce training offered by DAU. It also meets the statutory requirements in section 1746(a) of title 10 U.S. Code (codified in section 801 of the FY 2022 NDAA).

**Intellectual property (IP) game models.** AIRC is proposing to develop and exercise game-theory models from economics to explore DoD-unique negotiating equities and limitations to inform negotiation approaches, insights, and practices. This is important to improve workforce capabilities for DoD to negotiate and obtain needed IP and licenses.

**Contested logistics.** Working with SOCOM, AIRC is seeking to develop innovative approaches within student research teams to address specific operator-identified challenges. These will contribute to specific logistics challenges in contested operational environments.

**Acquiring joint enterprise solutions.** AIRC has been identifying key barriers to acquiring joint capabilities, then identifying potential organizational mechanisms that can address them. This challenge has endured for decades, and mechanisms are needed to develop and deploy joint enterprise capabilities such as the Joint All-Domain Command and Control System (JADC2).

**Policy test labs.** AIRC is developing simulation reference architectures in preparation for simulating and testing policy options in a specific domain (e.g., improve Small-Business Innovation Research (SBIR) outcomes in the SBIR program in the DoD). Here we will simulate policy effects to test and improve before implementation.

## Closing Thoughts

In summary, while AIRC is just two years old, the Center is already producing promising new and innovative ideas. Many of these ideas are major and structural; thus, they will be a challenge to fund, apply, and scale. Nevertheless, with strong leadership support, the DoD is using available resources to pursue key applied pilots.

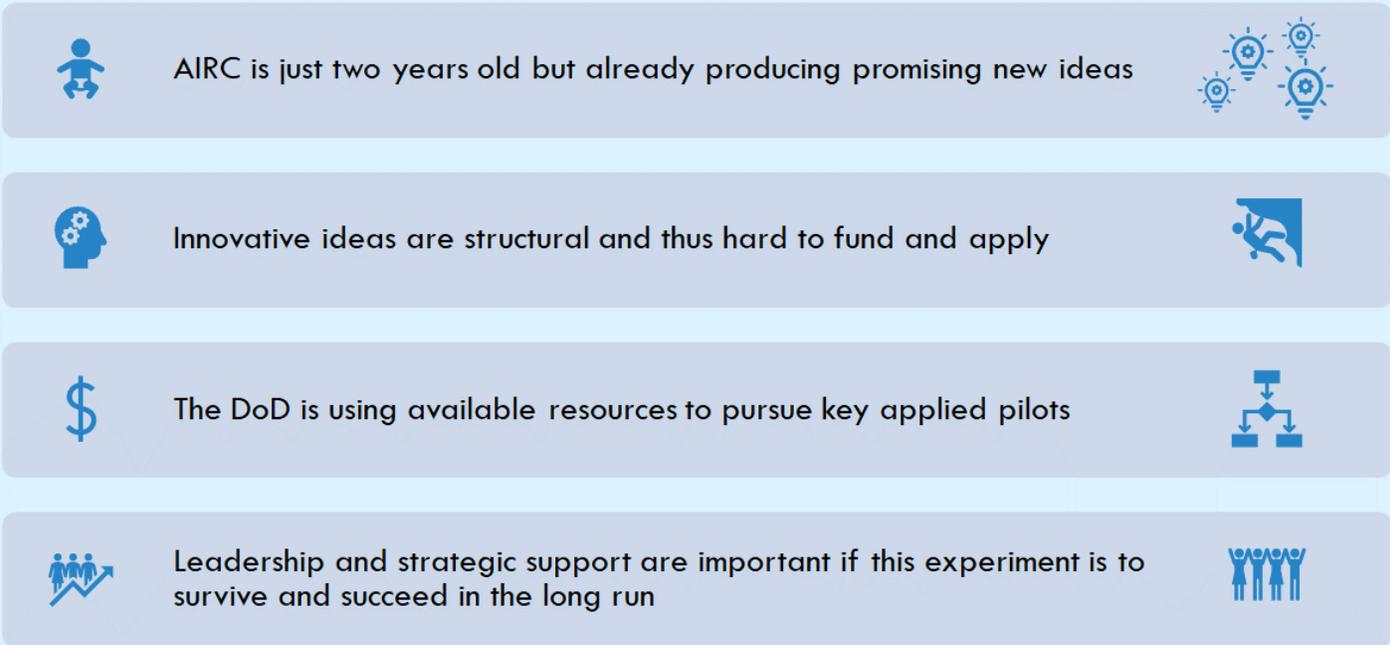


Figure 9: Summary of AIRC's Progress

As stated in Figure 9, continued support and continued realism in what can be accomplished from initial steps—are important if this experiment is to prosper and succeed in its mission. Applying academia to acquisition challenges is working.



## Appendix A. AIRC in Statute

*Below is the statute, codified in Title 10, U.S. Code (Release Point 117-113not103).*

### **§4142(f). Extramural acquisition innovation and research activities**

(a) ESTABLISHMENT.—The Secretary of Defense, acting through the Under Secretary of Defense for Acquisition and Sustainment and in coordination with the Under Secretary of Defense for Research and Engineering, shall establish and maintain extramural acquisition innovation and research activities as described in subsection (d), which shall include an acquisition research organization within a civilian college or university that is not owned or operated by the Federal Government that is established to provide and maintain essential research and development capabilities through a long-term strategic relationship with the Department of Defense.

(b) GOALS.—The goal of any activity (b) conducted pursuant to this section shall be to provide academic analyses and policy alternatives for innovation in defense acquisition policies and practices to policymakers in the Federal Government by using a variety of means intended to widely disseminate research findings from such an activity, in addition to executing demonstration and pilot programs of innovative acquisition policies and practices.

(c) DIRECTOR.—

(1) APPOINTMENT.—Not later than June 1, 2020, the Secretary of Defense shall appoint an individual from civilian life to serve as the director for the extramural acquisition innovation and research activities required by this section (referred to in this section as the "Director").

(2) TERM.—The Director shall serve a term of five years.

(d) ACTIVITIES.—The activities described in this subsection are as follows:

(1) Research on past and current defense acquisition policies and practices, commercial and international best practices, and the application of new technologies and analytical capabilities to improve acquisition policies and practices.

(2) Pilot programs to prototype and demonstrate new acquisition practices for potential transition to wider use in the Department of Defense.

(3) Establishment of data repositories and development of analytical capabilities, in coordination with the Chief Data Officer of the Department of Defense, to enable researchers and acquisition professionals to access and analyze historical data sets to support research and new policy and practice development.

(4) Executive education to—

(A) support acquisition workforce development, including for early career, mid-career, and senior leaders; and

(B) provide appropriate education on acquisition issues to non-acquisition professionals.

(5) On an ongoing basis, a review of the implementation of recommendations contained in relevant Department of Defense and private sector studies on acquisition policies and practices, including—

(A) for recommendations for the enactment of legislation, identify the extent to which the recommendations have been enacted into law by Congress;

(B) for recommendations for the issuance of regulations, identify the extent to which the recommendations have been adopted through the issuance or revision of

regulations;

(C) for recommendations for revisions to policies and procedures in the executive branch, identify the extent to which the recommendations have been adopted through issuance of an appropriate implementing directive or other form of guidance; and

(D) for recommendations for the resources required to implement recommendations contained in relevant Department of Defense and private sector studies on acquisition policies and practices.

(6) Engagement with researchers and acquisition professionals in the Department of Defense, as appropriate.

(e) FUNDING.—Subject to the availability of appropriations, the Secretary may use amounts available in the Defense Acquisition Workforce and Development Account to carry out the requirements of this section.

(f) ANNUAL REPORT.—Not later than September 30, 2021, and annually thereafter, the Director shall submit to the Secretary of Defense and the congressional defense committees a report describing the activities conducted under this section during the previous year.



## Appendix B. The Structure of AIRC

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The Secretary of Defense created AIRC on September 28, 2020, in response (in part) to section 4142(f) of title 10 U.S. Code. AIRC has achieved its goals for its inaugural year, and a breadth of activities have been funded to engage AIRC on key challenges facing the DoD.

AIRC is a 22-university collaboration<sup>2</sup> within the DoD's SERC University-Affiliated Research Center (UARC). This structure substantially accelerated its establishment and ensures broader engagement of academia on DoD challenges. Advisory boards were established, activated, and consulted to identify innovative ideas and ensure alignment with DoD priorities. Acquisition research focus areas were considered, discussed, and finalized through those boards and were approved by DoD acquisition leadership. As required by 10 U.S. Code 4142(c), DoD appointed a director, Dr. Dennis McBride. He has 40 years of experience at the intersection of science, technology, national security, and public policy. He was appointed in January 2022. Emphasis in AIRC is placed on applied experiments, prototypes, and demonstrations (beyond white papers and publications) to address and test solutions to enduring challenges in defense acquisition policies, practices, education, training, and decision-making.

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<sup>2</sup> The 20 extramural SERC/AIRC collaborator universities (before the ongoing reassessment is completed) are: Auburn University, Carnegie-Mellon University, Georgetown University, Georgia Institute of Technology (Georgia Tech), Massachusetts Institute of Technology, Missouri University of Science and Technology, North Carolina Agricultural and Technical State, Old Dominion University, Pennsylvania State University, Purdue University, Stevens Institute of Technology (*lead*), Texas A&M University, University of Alabama in Huntsville, University of Maryland, University of Massachusetts Amherst, University of Southern California (USC), University of South Florida, University of Virginia, Virginia Polytechnic Institute and State University (Virginia Tech), and Wayne State. Two (2) collaborating military universities include the Air Force Institute of Technology (AFIT) and the Naval Postgraduate School (NPS). AIRC also has access to five other universities: George Mason University, The George Washington University, North Carolina State University, The Ohio State University, and The University of Arizona. AIRC also seeks participation with other Historically Black Colleges and Universities (HBCUs) and other Minority Institutions (MIs) besides North Carolina A&T State (official lists of HBCUs MIs are at <https://sites.ed.gov/whhbcu/one-hundred-and-five-historically-black-colleges-and-universities/> and <https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst-list-tab.html>).



## Acronyms and Abbreviations

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A&S	Acquisition and Sustainment
ACAT	Acquisition Category
AE	Acquisition Enablers
AI	Artificial Intelligence
AI/ML	Artificial Intelligence and Machine Learning
AIRC	Acquisition Innovation Research Center
Army CCDDC	Army Combat Capabilities Development Command
ASD(A)	Assistant Secretary of Defense for Acquisition
ASD(S)	Assistant Secretary of Defense for Sustainment
CAPE	Cost Assessment and Program Evaluation
CDD	Capability Development Document
CDO	Chief Data Officer
CIV	Civilian
COCOM	Combatant Commands
CUI	Controlled Unclassified Information
DASD	Deputy Assistant Secretary of Defense
DAU	Defense Acquisition University
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
DOT&E	Director Operational Test and Evaluation
DPC	Defense Pricing & Contracting
E&ER	Environment and Energy Resilience
FY	Fiscal Year
GMU	George Mason University
GTRI	Georgia Tech Research Institute
GW	George Washington University
HBCU	Historically Black College or University
IAPRs	Integrated Acquisition Portfolio Reviews
ICD	Initial Capabilities Document
IDEAS	Innovative, Data-Enabled Acquisition Strategy
IP	Intellectual Property
JADC2	Joint All-Domain Command and Control System

JS	Joint Staff
MDAP	Major Defense Acquisition Program
MI	Minority Institution
MIL	Military
ML	Machine Learning
MR	Materiel Readiness
MSI	Minority-Serving Institution
MTA	Middle Tier of Acquisition
NAVAIR	Naval Air Systems Command
NCSU	North Carolina State University
NDAA	National Defense Authorization Act
NPS	Naval Postgraduate School
OSD	Office of the Secretary of Defense
OUSD	Office of the Under Secretary of Defense
OUSD(R&E)	Office of the Under Secretary of Defense for Research & Engineering
PII	Personally Identifiable Information
PPBE	Planning, Programming, Budgeting, and Execution
SBIR	Small-Business Innovation Research
SERC	Systems Engineering Research Center
SOCOM	U.S. Special Operations Command
SORRD	Special Operations Rapid Requirements Document
T&E	Training and Evaluation
UARC	University-Affiliated Research Center
UMD	University of Maryland
USC	University of Southern California
USAF	United States Air Force
USSF	United States Space Force
UVA	University of Virginia